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(19)(CA) **CANADIAN PATENT** (12)

(54) Propeller Drive Arrangement for Ship or the Like

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(57) 3 Claims

Canada

A propeller-drive arrangement for a ship or the like

This invention relates to a propeller-drive arrangement for a ship or the like, comprising an electric motor; a propeller mounted on a shaft of the motor directly or through a gear; and a water-proof, generally cylindrical chamber provided with a sealed shaft opening, the electric motor with the shaft thereof being positioned within said chamber.

Conventional prior propeller-drive arrangements have been realized by positioning an electric motor within the body of a vessel and the shaft of the motor has been arranged to extend outside the vessel through an opening sealed water-proof, and a propeller has been attached to the end of the shaft. By means of a structure of this type, it is possible to transmit even extremely great shaft powers, especially in cases where no gearing has been provided on the shaft. Therefore, the structure is used in the largest ice-breakers, for instance. However, when using this kind of propeller-drive system, it is necessary to provide the vessel possibly with several smaller auxiliary propellers and, further, with rudder means, in order that the vessel could be steered sufficiently accurately. Such auxiliary propeller-drives as well as the easy damageability of the rudder means especially in ice-breakers increase the price of the apparatus and cause a frequent need for maintenance. The propeller-drive arrangement of German Offenlegungsschrift 2 406 548, similar to that described in the beginning, has the same drawbacks.

Attempts have been made to eliminate the above-mentioned problems by a pivotable propeller, which, however, requires that the shaft between the motor and the propeller has to be provided with several breaking

joints and gears. Further, structures have been suggested in which the motor is positioned immediately above the propeller, whereby the shaft need not be provided with breaking joints, whereas power transmission from the motor shaft to the propeller shaft still requires a gear or a number of cog wheels. However, such gear and cog wheel transmissions always restrict the powers to be transmitted to some extent. Accordingly, the transmission of powers as great as 10 MW, to be used in ice-breakers which are being planned, cannot possibly be effected through such transmissions.

The object of the present invention is to provide a new propeller-drive arrangement, in which the above-mentioned problems are avoided by a pivotable propeller which, however, does not substantially limit the shaft power. This is realized by means of a propeller-drive arrangement according to the invention, which is characterized in that the chamber containing the electric motor and the shaft is secured pivotably to the body of the ship by means of a tubular shaft. In this way the propeller can, if required, be mounted directly on the shaft of the electric motor, and nevertheless the propeller can be pivoted for making the ship steerable. The tubular shaft is preferably mounted in bearings on a support block secured to the body of the vessel so that the upper end of the block is positioned above the water line of the vessel. As a consequence, the space between the tubular shaft and the support block need not necessarily be sealed water-proof, since the support block ends above the water line.

In the following the propeller-drive arrangement according to the invention will be described in more detail with reference to the attached drawings,

wherein

Figure 1 is a schematical view of a prooeller-drive arrangement according to the invention;

Figure 2 illustrates the pivotability of the propeller-drive arrangement of Figure 1; and

Figure 3 illustrates the propeller-drive arrangement according to the invention when arranged under the rear of a vessel.

Figure 1 shows schematically a partial sectional view of the propeller-drive arrangement according to the invention in a ship or the like watercraft. An electric motor 1 with a shaft 2 thereof is therein arranged in a water-proof, generally cylindrical chamber 6 provided with a sealed shaft opening 5. The chamber is secured pivotably to a body 8 of the vessel by means of a tubular shaft 7. In Figure 1, a pressure bearing 3 supporting the shaft 2 of the motor is positioned between a propeller 4 and the shaft 2. If necessary, it is also possible to position a gear between the motor 1 and the propeller 4. However, as stated above, such a gear is not at all necessary; on the contrary, it need not, and more precisely, must not be used with great shaft powers used in ice-breakers, for instance. The speed of rotation of the propeller 4 can be controlled in a usual way by controlling the speed of rotation of the electric motor 1, which can be effected either as inverter drive or cycloconverter drive. The cycloconverter drive is particularly suitable when the powers are as great as 10 MW. Cables required for the power supply of the electric motor as well as the supply and discharge pipes for the cooling water possibly required thereby are brought into the chamber 6 through the hollow tubular shaft 7 thereof. By positioning these electric cables and pipe connections (not shown) in the vicin-

ity of the central axis of the tubular shaft 7, there will occur no major problems with the turning of the chamber during the pivoting of the propeller. The tubular shaft 7 connected to the water-proof and steadily built chamber 6 goes through the bottom 8 of the vessel and is secured at the upper end thereof to a support block 12 supported on the body of the vessel by means of a support bearing 9. Figure 1 further shows support bearings 10 and 11 which are positioned respectively at the upper portion of the support block 12 and at a point where the tubular shaft goes through the bottom 8 of the vessel. As the support block 12 is fastened in a water-proof manner to the bottom 8 of the vessel and as it is so high that the support bearing 9 is positioned above the water line of the vessel, it is not necessary to seal the gap between the tubular shaft 7 and the support block 12. If desired, such a sealing can be effected by conventional sealing techniques. Similarly, the shaft opening 5 of the motor 1 can be effected by means of conventional water-lubricated seals known from the shaft openings used in ships. In Figure 1, a form part 13 is provided around the tubular shaft 7 between the chamber 6 and the bottom 8 of the vessel so as to give this shaft section a more hydrodynamic shape. Since the length of the chamber 6 shown in Figure 1 may be even ten metres, the diameter of the tubular shaft 7 is also significant, whereby it is possible to carry out the maintenance operations of the electric motor and the gear through the tubular shaft even during normal operation of the vessel.

Figure 2 is a top view of the water-proof chamber 6 and the propeller 4 positioned at the end thereof. In Figure 2, the pivoting angle of the centre of the tubular shaft 7 of the chamber 6 with respect

to the body of the vessel is indicated with α. A sufficient steerability of the vessel is obtained when α is $\pm 180^{\circ}$. The ship can thereby be driven both forwards and backwards even without changing the direction of rotation of the propeller, which, of course, is easy to realize by varying the polarity of the power supply to the electric motor.

Figure 3 shows the propeller-drive arrangement according to the invention when attached under the rear of a relatively large vessel 14. It can be judged from this figure 3 that the propeller 4 is normally positioned on the side of the body of the vessel, whereby it is well protected by the body of the vessel. On the other hand, it is to be seen that the dimensions of the chamber 6 and the propeller 4 are fairly large, the total length, e.g., being about 15 m. As is to be understood, in most cases there are two or three propeller-drive arrangements of this kind positioned over the width of the rear of one and the same ship, spaced suitably from each other.

The propeller-drive arrangement according to the invention has been described above only by means of one specific embodiment, and it has been shown when attached to a vessel of one particular type only. However, is it to be understood that the propeller-drive arrangement according to the invention offers a very interesting alternative, which can be applied in connection with vessels of various types. It can be applied, for instance, in connection with barges or the like cargo vessels, so that the propeller-drive arrangement is positioned on a lattice structure disposed outside of the proper body of the vessel. In this way the body of the vessel can be better utilized as a cargo space. In addition, the propeller-drive arrangement according to the invention is steady and

simple in structure, being thus suitable for use even under difficult conditions and particularly when great shaft powers are required.

The embodiments of the invention in which an exclusive property of privilege is claimed are defined as follows:

1. A propeller-drive arrangement for a ship or the like, comprising an electric motor; a propeller mounted on a shaft of the motor directly or through a gear; and a water-proof, chamber provided with a sealed shaft opening, the electric motor with the shaft thereof being positioned within said chamber, characterized in that the chamber is secured pivotably to a body of the ship by means of a tubular shaft.

2. A propeller-drive arrangement according to claim 1, characterized in that the tubular shaft is mounted in bearings on a support block supported to the body of the vessel, the upper end of the support block being positioned above the water line of the ship.

3. A propeller as defined in claim 1 or 2, wherein said chamber is cylindrical.

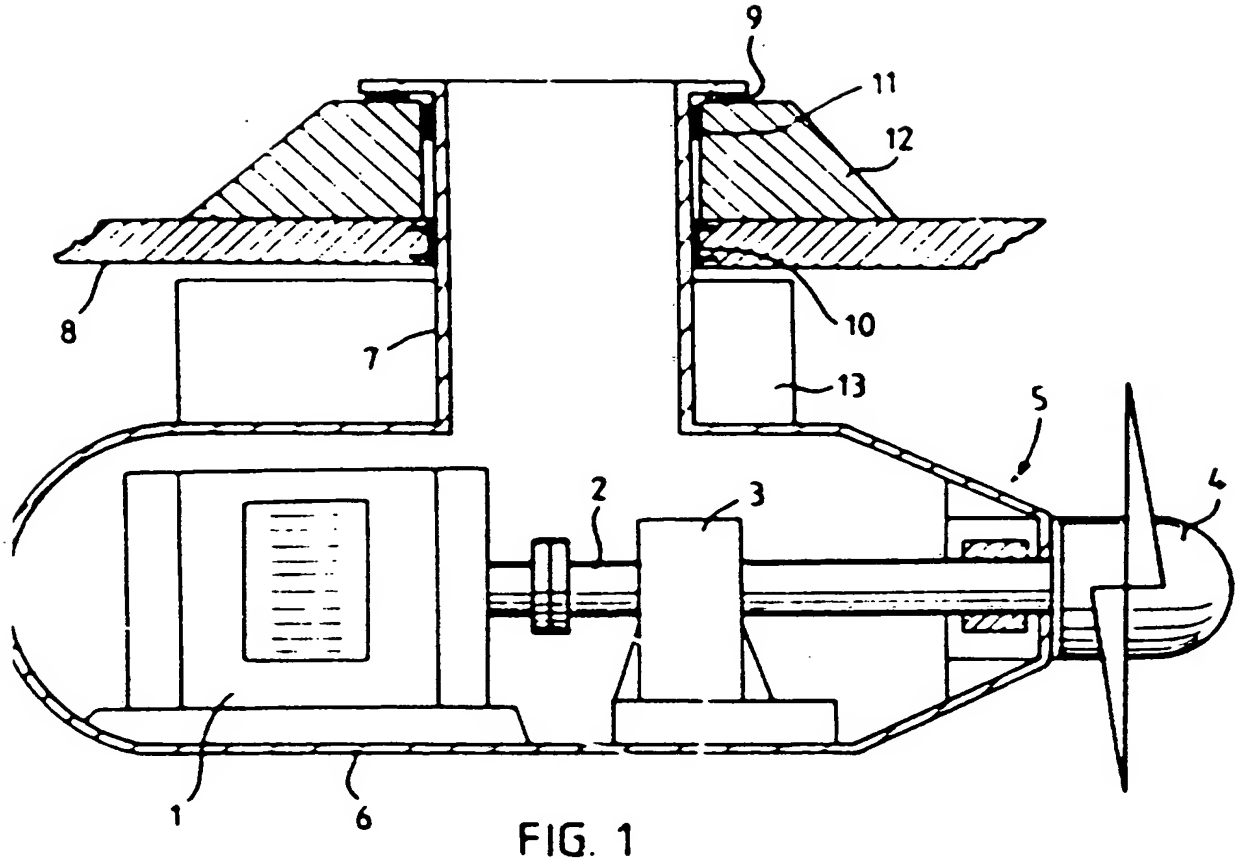

FIG. 1

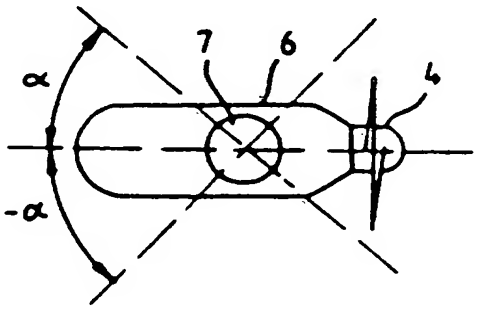

FIG. 2

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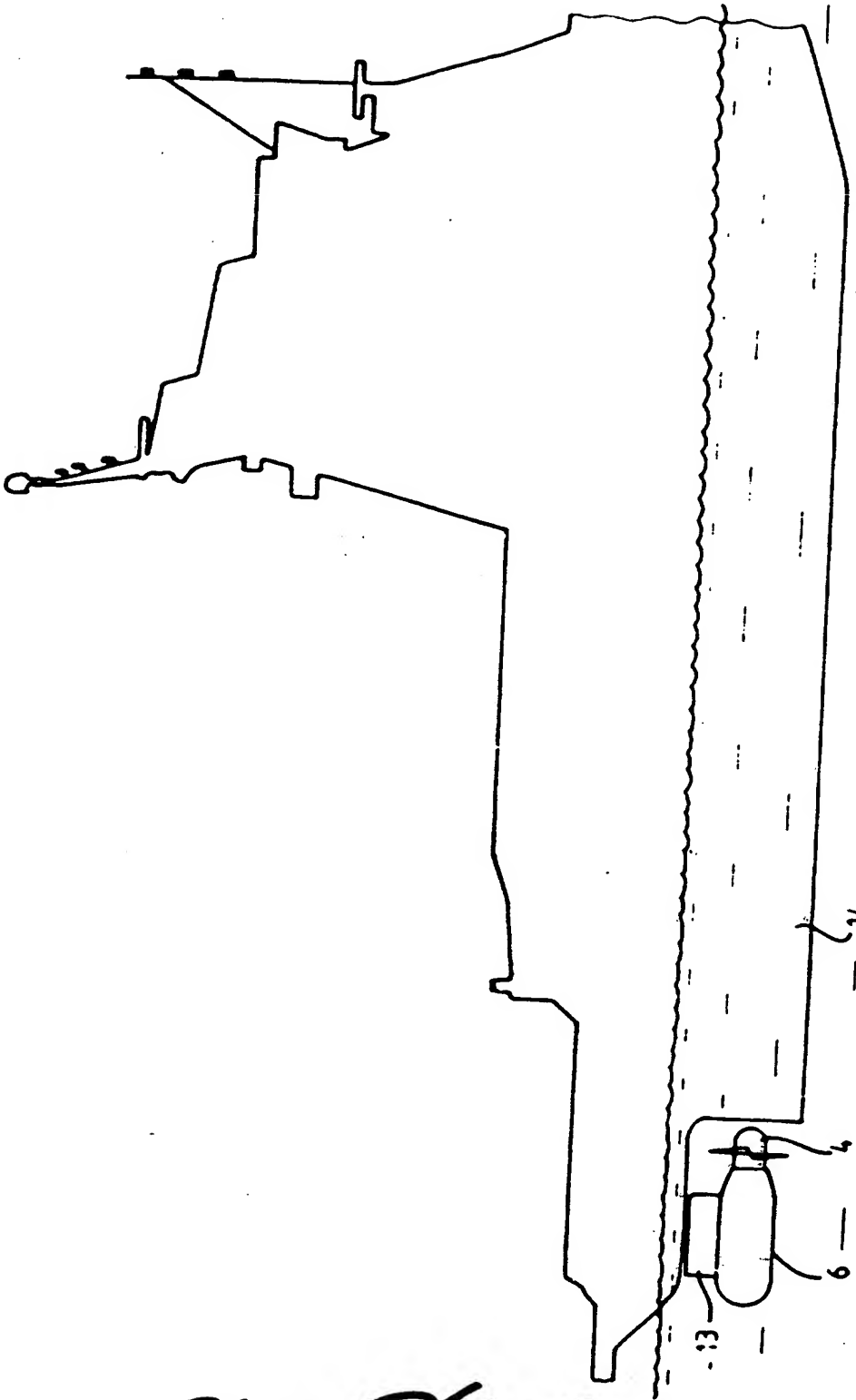

FIG. 3

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